BY KEVIN M. SAVETZ

The MBONE

Multimedia Broadcasting For Everyone?

In its short history, the Internet has seen more than its share of revolutions. First came the revolution in global communications with email and Usenet. After that there was the revolution in information sharing with FTP and Gopher. In the past few years, the World Wide Web has revolutionized the presentation of information. Governments, magazines, television networks, businesses, and any number of other organizations are turning to the Web as a new means of getting to their audience.

But the most significant revolution of all might well be the one merely around the corner. With the development of something called the multimedia backbone, or MBONE, the Internet suddenly becomes a hotbed of real-time multimedia communications. In essence, it becomes an interactive boardroom, classroom, television, cinema, videogame, and edutainment provider, the kind only dreamed of in the hype about the information superhighway.

The MBONE will eventually make it possible for all of us to start our own Internet-based TV show, if we wish, without so much as an FCC license or a transmitter. Or teach an online classroom with students from ten different states. Or participate in an important videoconference with researchers from around the globe.

On the Internet, as in other aspects of life, new technologies are first available to a core group of inventors and experimenters. If it's good enough or interesting enough or worthwhile enough, word gets out. Other folks begin to hear the wonders of the new technology; they want to try it out, they find out what they need, then they spend whatever time and money is necessary to join in. Slowly, the technology gains wider and broader acceptance, with more and more people taking part, until at last it becomes so common that it's practically a household word.

Take, for example, electronic mail. Or the World Wide Web. Or the waffle iron.

Over the past few years, the MBONE has been making its way onto the Internet slowly and experimentally. But its speed of adoption may soon increase exponentially, because even those of us who today rely on home computers and mere modems will soon have access to the technologies necessary to bring it into our homes.

Today, we "regular Internet users" are at the cusp of a new multimedia revolution. Those of us pushing the limits of a 14.4Kbps connection can already use some cool new multimedia tools. In the coming months, true multimedia will become more commonplace for "regular users" as our bandwidth limitations decrease and as hackers continue to improve compression methods for stuffing more information down that thin 14.4Kbps link.

Even for those who have the hardware to do multicasting today, there's another huge hurdle preventing the MBONE from taking over the Internet: Bandwidth.

What Is The MBONE?

The Internet has traditionally been used to send information to one person (or computer) at a time. The information transmitted has a specific destination, as in an email message that reaches a specific (single) person. A request for a Web page is transmitted to a single host, and the host sends back the requested information to the single recipient. Although computers can handle hundreds (or thousands, or millions) of these requests every second, the information being moved around is still one-to-one: one computer is sending the information, and only one computer is receiving it.

This seems like a perfectly fine arrangement until you consider what happens when you want to send information simultaneously to more than one person. Let's use an email message as an example, one to which you've attached a graphics file. If you send that message to your friend in England, you'll chew up a certain amount of bandwidth.

Now, as any seasoned Internaut knows, you can address an email message to two, three, or twenty people at the same time. If you send this file to all twenty, you create twenty times as much Internet traffic. So if a band like R.E.M. wanted to transmit a live concert across the Internet to 150,000 of their closest friends, well, you can easily imagine how quickly the net would clog up.

The next generation of groundbreaking tools on the Internet will be IP multicast or MBONE programs. These tools change the rules of the road: they allow packets of information to be "broadcast" to anyone who is "listening" rather than to a specific individual or computer. These

continued on page 250

Online Services *continued from page 106*

ty-five industry categories. Specific names for people, products, or company names can be included here.

Special Reports provide a listing of magazine and newsletter articles and reports relevant to each infoMCI user's information profile. Customers can receive up to five headlines and abstracted articles along with a price for the full-text retrieval.

infoMCI's Press Digest supplies daily abstracts from the *New York Times, Wall Street Journal,* and *Washington Post.* News Columns deliver weekly finance columns and targeted news summaries from publishers like *Mutual Fund Week, Finance Week, Stock Week,* and *Business Traveler.* The Business Focus columns provide cross-industry reference articles according to business segments, from publishers including *This Week in Retail, This Week in Manufacturing, Office Automation Week,* and *Managing Your Business,* which features useful tips for the small business manager.

internetMCI is the network's window into the World Wide Web and features marketplaceMCI, a secure electronic shopping area. internetMCI is offered as a core component of networkMCI Business, and also as a stand-alone software package.

Beyond content, messageMCI integrates email, faxing, and paging into one application, helping MCI users reach all the resources of the global MCI Mail network, offering connections to most major email networks. Advanced features include: address book, point-and-click configuration of access numbers for sessions from home, office or some other on-the-road-location, and simple tools for seamless conversion between Lotus Express and MCI Mail Express messages.

conferenceMCI enables document sharing, allowing up to twenty-four users at different locations to collaborate on and edit spreadsheets, word processing documents, and artwork. Desktop video is also available optionally. This multipoint videoconferencing works on H.320 industry-standard technology to provide full-motion, real-time desktop videoconferencing. A unique application-sharing feature allows simultaneous desktop videoconferencing and document sharing/modification, and enables all participants to utilize an application based on only one user's computer.

Finally, networkMCI Conferencing Scheduler allows online booking for voice, document, and/or videoconferences. The electronic scheduler makes the reservations and sends back an email message to all parties confirming the type of conference, time, phone numbers, and other vital do-lunch details.

The new release of networkMCI Business is free to existing customers, and is available to new customers for $100. Even more attractive to small business users and start-ups, the monthly fees for infoMCI have been reduced to $35 per month for customers under MCI Vision, VNet or networkMCI Calling for Small Business Plans. Internet access from MCI is around $10 per month, which includes five hours of local access and $2.50 for each additional hour. Toll-free MCI 800 access to the Internet is also available for $6.50 per hour.

Desktop videoconferencing equipment can be leased under a three-year agreement for as low as $120 per month; this includes desktop video camera, speakerphone, and video and audio boards. For more information on networkMCI Business, call 1-800-955-6505 or visit the Web site at *www.internetMCI.com* . ■

Copyright © 1996 by Bill Gram-Reefer. All rights reserved.

The MBone *continued from page 112*

With The MBONE, You Can:

- collaborate with colleagues in real time using a shared virtual "whiteboard"
- hear and see live lectures from famous professors or scientists, and even ask them questions
- listen to radio stations "broadcasting" on the Internet
- start your own radio show, if you are so inclined
- see live pictures of space bound NASA astronauts working on the space shuttle.
- attend a virtual poetry reading, hearing the author's actual voice
- see and hear rehearsals of Silicon Valley garage bands
- attend an Internet Engineering Task Force meeting without leaving your office

...And although the following things haven't happened yet, in the future the MBONE may allow you to:

- watch a customized version of CNN right from your computer screen
- engage 5,000 other people in a huge, intercontinental computer game
- see reruns of *Gilligan's Island,* and share your snide comments in real time with faraway friends.
- put your own garage band's rehearsals online for all to see (and hear)
- automatically download and install authorized upgrades and bug-fixes to your computer software, without your intervention.
- chat in real time with twenty other people–like with the current Internet Relay Chat, except using your voice instead of your overworked fingers
- do plenty of other things that haven't been thought of yet

packets aren't sent individually to each recipient; instead, only one stream gets sent, but it ends up at all the specified destinations at (more or less) the same time. This is called "multicasting."

You can think of multicasting as the Internet's version of broadcasting. A site that multicasts information is similar in many ways to a television station that broadcasts its signal: the signal originates from one source but can reach everyone in the station's signal area. The signal takes up some of the finite available bandwidth, and anyone with the right equipment can tune in. For those who don't want to catch the signal or don't have the right equipment, the information passes by.

Why is that interesting? Because IP multicasting lends itself to a whole new way to publish information on the Internet. Instead of the electronic equivalent of a one-on-one chat, you can have a megaphone, broadcasting to everyone who cares to listen. And the people who do the listening can send something right back, not just to you but to everyone else as well.

The MBONE is today's implementation of IP multicasting. As the MBONE gathers steam, it promises a thorough and irrevocable shift in how the world communicates. It promises, in others words, a revolution of its very own.

MBONE Is For Power Users

Although the MBONE is free to use for anyone who has the right equipment, the hardware and connectivity requirements are much greater than those of the common home Internet user. A PC or Macintosh system coupled with a standard modem doesn't have enough computing power or bandwidth to send or receive MBONE transmissions.

You need a good deal of power to handle multicast IP. Today, multicasting software—the behind-the-scenes tools for moving, encoding, decompressing, and manipulating multicast packets—is only available for high-end UNIX workstations such as those from Sun, DEC, HP, IBM, and Silicon Graphics.

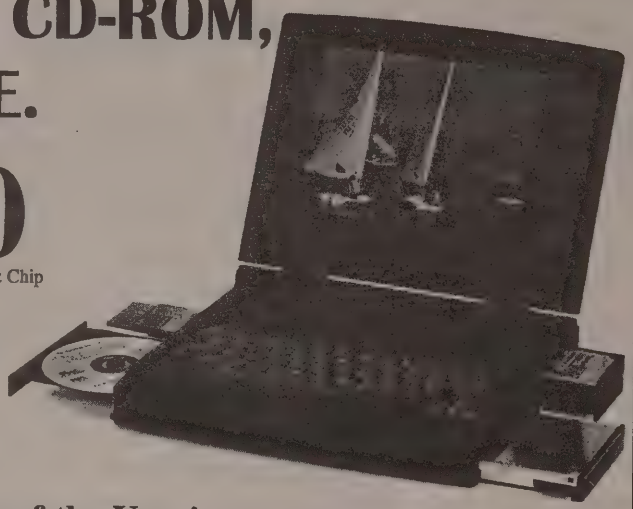
This is changing, however. Multicasting tools are becoming available for Linux—a free UNIX-like operating system that runs on (relatively) cheap IBM PC-compatible computers (Apple recently announced that a Mac ver-

continued on page 252

PENTIUM® MICROPROCESSOR, 4X SPEED CD-ROM, TFT-ACTIVE.

$2950

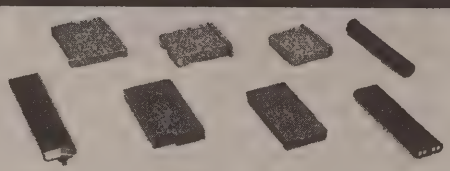
Price starting with Pentium® 75MHz Chip



For every notebook you order
➡3 Years Limited Warranty.
➡Free 5-CD Titles.
➡Free Ground Shipping.

Best Value Notebook of the Year!

NOTEBOOK BATTERY



- MACINTOSH
- TEXAS INTRUMENT
- TOSHIBA
- IBM THINKPAD
- COMPAQ
- AST
- NEC
- HP OMNIBOOK
- OTHER Notebooks and Compatibles, Please call.

EXPRESS SERVICE — 72-HR TURNAROUND SERVICE TIME subject to parts, model & availability

All PMD II Systems come with a 72 hours Express Service.

*All trademarks are the property of their respective owners.
Price, Specification & Availability Subject to Change without Notice.

ASTRO NOTE
PENTIUM® PMD - II

Features:

- TFT-Active SVGA 10.4" Display
- 8MB RAM, True 64-Bit Bus
- Local Bus IDE 810MB Hard Disk
- Quad Speed CD-ROM Drive (Interchangeable with a Battery)
- Integrated Track Point Mouse
- 1.44MB Floppy Drive (Interchangeable with a Battery)
- PCMCIA Slot: 1-Type III & 1-Type II, or 2-Type II
- Stereo Sound System: Stereo Speakers, MIDI port, Headphone and Microphone jacks
- Ni-Mh Battery w/AC-adapter Charger
- MPEG & TV Tuner (Optional)
- Full Docking Station (Optional)

ASTRO Research
FUTURISTIC NOTEBOOK PCs, TODAY!
http://www.astronote.com

TO ORDER, CALL
1-800-FOR-NOTE
600 Monterey Pass Road, Monterey Park, CA 91754, FAX: (818) 293-1655

HAVE QUESTIONS...CALL THE TECHNICAL EXPERTS

We specialize in vertical markets. Call us for the right solution for your needs.
BUSINESS INTEGRATION • INTERACTIVE • DATA RECOVERY

GiGa BYTES

Authorized Dealer For:
NOVELL. Authorized Dealer COMPAQ QMS NEC IBM TOSHIBA SCO Tektronix HEWLETT PACKARD ALR

Trust Us, We're Different
Quality Service & Upgrades • On-Site & In-Shop Service

(510) 440-8032 Fax (510) 440-9099

The MBone

continued from page 250

sion was in the works). Since MBONE tools can work on a Linux-based PC, it's not too much to imagine that soon MBONE tools will be available for home computers like Macs or PCs running Microsoft Windows. Most likely, only the most powerful computers, such as those with Pentium and PowerPC chips, will be able to handle MBONE tools at first, but the trend for more widespread use is definitely underway. The software tools are being built: PC/TCP v2.3 from FTP Software Inc. supports multicasting for PCs, as does Windows 95, and it is rumored that the next version of MacTCP will support multicasting.

A site that multicasts information is similar in many ways to a television station that broadcasts its signal: the signal originates from one source, but can reach everyone in the station's signal area. The signal takes up some of the finite available bandwidth, and anyone with the right equipment can tune in.

Even for those who have the hardware to do multicasting today, there's another huge hurdle preventing the MBONE from taking over the Internet. That hurdle is bandwidth: most of us just don't have enough of it. A multicast video stream of 1-4 frames per second eats about 128Kbps of bandwidth, about nine times the speed of a 14.4Kbps modem. Audio multicasts, partly because of their smaller bandwidth requirements, are more common on the MBONE than video. Multicast audio typically uses 56 to 64Kbps of bandwidth.

Today, there are about 1,700 networks (in about twenty countries) on the MBONE, meaning the MBONE is available on approximately 3% of the Internet.

The MBONE needs to come a long way—overcoming today's limitations in bandwidth and computing power—before it becomes a household word. However, it's very likely that within the next few years—given the growing popularity of ISDN and the advent of improved data compression techniques—that the MBONE will become the next "killer app" of the Internet. ■

Copyright © 1996 by Kevin M. Savetz. All rights reserved.